



High Speed Rail (West Midlands - Crewe)

Environmental Statement

Volume 5: Technical appendices
Wider effects report (CT-005-000)



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Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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A report prepared for High Speed Two (HS2) Limited:

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1 Introduction

1.1 Overview

- 1.1.1 The High Speed Rail (West Midlands - Crewe) Environmental Statement (ES) mapping, contained within the Volume 2 and 5 Map Books, shows the Proposed Scheme on the centre line for the permanent works. Limits of deviation shown on the Parliamentary plans and sections and described in the hybrid Bill enable the Proposed Scheme to deviate slightly from the centre line of the works as may be required following detailed design. This Appendix assesses whether the power to deviate within these statutory limits would alter the significant predicted effects reported elsewhere in the ES by creating new or different (usually increased) significant effects.
- 1.1.2 The powers contained within the hybrid Bill allow for changes within the statutory limits of deviation to occur where it is found that the spatial position of the Proposed Scheme may need to be adjusted, mainly for reasons of engineering practicability.
- 1.1.3 A summary of the extent of the limits of deviation is described in Volume 1, Section 1.3. In essence these comprise lateral limits within the lines shown on the Parliamentary plans and vertical limits not exceeding 3m upwards, and downwards to any extent, from the levels shown on the deposited sections, except for certain buildings, such as those within the Infrastructure Maintenance Base – Rail (IMB-R) near Stone, where an upper height limit is specified. The limits of deviation for the tunnels at Whitmore Heath and Madeley allow for the tunnels to deviate so that an appropriate clearance from any unexpected obstruction in the ground can be provided. The degree of adjustment is constrained by the limits of deviation but also by key design elements of the Proposed Scheme such as the alignment of the track system, which must allow for high speed trains to operate to the proposed timetable, the position of tunnel portals, the height of viaducts and the location of significant third party infrastructure.
- 1.1.4 The power to deviate the vertical or horizontal alignment within statutory limits requires assessment for its likely significant environmental effects at various locations along the route of the Proposed Scheme.

1.2 Analysis and assessment

- 1.2.1 A sensitivity analysis has been undertaken to identify where such spatial changes are feasible and assess the environmental implications of such changes, taking account of the reported assessment of likely significant effects and the environmental baseline described for the Proposed Scheme in the Volume 2: Community area (CA) reports (CA1: Fradley to Colton; CA2: Colwich to Yarlet; CA3: Stone and Swynnerton; CA4: Whitmore Heath to Madeley; and CA5: South Cheshire).
- 1.2.2 The following sections describe locations within the relevant community area, which have been subject to further assessment. A commentary is provided on the likely significant environmental effects, which could result from a change in alignment within the statutory limits of deviation.
- 1.2.3 An assessment of the likely significant effects of raising the height of the IMB-R building and associated structures near Stone up to the upper limit shown on the

sections is reported, as the assessment elsewhere in the ES has assumed a height lower than the upper limit.

1.2.4 Locations where amendments to the alignment within the statutory limits of deviation are judged not to give rise to new or different predicted significant effects are not considered further in this report.

1.2.5 Where appropriate, references have been made to potential mitigation that could be considered in specific locations. Such mitigation could only be confirmed following further assessment and discussion with relevant stakeholders as part of the detailed design process for any alignment modifications.

1.3 Environmental minimum requirements

1.3.1 In order to ensure that the environmental effects of the Proposed Scheme will not exceed those set out in the ES, the Secretary of State will establish a set of controls known as Environmental Minimum Requirements (EMR). The EMR will be contained in a suite of documents that will sit alongside the provisions set out in the hybrid Bill itself. The nominated undertaker is the body to be appointed to take forward the detailed design and implementation of the Proposed Scheme after the hybrid Bill has been enacted. The nominated undertaker will be required to comply with the EMR and the other hybrid Bill controls, such as any undertakings and assurances given by the Secretary of State.

1.3.2 During the passage of the hybrid Bill through Parliament, the Secretary of State will confirm to Parliament the scope of, and the documents forming, the EMR; and will make a commitment to Parliament to take whatever steps he/she considers reasonable and necessary to secure compliance with them.

1.3.3 The EMR, together with the controls in the hybrid Bill, will ensure that the impacts set out in the ES will not be exceeded, unless this results from a change in circumstances that was not foreseeable at the time the ES was prepared; or any such changes will be unlikely to have significant adverse environmental effects; or will be subject to a separate consent process and further environmental impact assessment.

1.3.4 The EMR will also impose a general requirement on the nominated undertaker to use reasonable endeavours to adopt measures to reduce the reported adverse environmental effects, provided that this does not add unreasonable cost or delay to the construction or operation of the Proposed Scheme.

1.4 Operational sound, noise and vibration considerations

Surface sections

1.4.1 To avoid or reduce significant airborne noise effects during operation, the Proposed Scheme incorporates noise barriers in the form of landscape earthworks and/or noise fence barriers. Noise barrier locations are shown in the Volume 2: Sound, noise and vibration Map Book (SV-05 series). These maps also identify engineering cuttings and retaining walls as noise barriers where they will avoid or reduce significant adverse noise effects.

- 1.4.2 The effective height of the noise barriers are described relative to the rail level. Therefore, any amendment to the vertical rail level will equally move the noise barrier so that the extent of noise reduction is maintained.
- 1.4.3 Some earthworks are not provided primarily for noise purposes and therefore, removal of these features, or reducing their attenuation by raising the vertical alignment, would not materially alter the assessment reported elsewhere in the ES.
- 1.4.4 There are locations where existing features such as hills, roads and railways, will provide some mitigation to the Proposed Scheme, which if the alignment was raised vertically, could be reduced and may result in a new or increased significant noise effect.
- 1.4.5 Following any change in alignment within the limits of deviation, further detailed modelling would be undertaken to confirm the predicted noise effects described in this report. If significant effects are confirmed, suitable mitigation in the form of noise barriers would be provided within the limits of deviation. With this mitigation in place, no additional residual significant noise effects are considered to be likely. The introduction of new noise barriers may require additional visual mitigation in the form of earthworks, planting or external finish.

Tunnelled sections

- 1.4.6 Following any change in alignment within the limits of deviation, detailed modelling would be undertaken to confirm the predicted ground-borne noise effects described in this report. If those significant effects are confirmed, all reasonably practicable steps will be taken to mitigate those effects.

2 Assessment of likely significant effects

2.1 CA1 - Fradley to Colton

River Trent viaduct to Pipe Ridware embankment

- 2.1.1 Raising the vertical alignment of the River Trent viaduct and Pipe Ridware embankment by up to 3m would increase the significant predicted landscape and visual effects, including those on residential properties in Pipe Ridware, Nethertown and Upper Nethertown Farm.
- 2.1.2 As described in the Volume 2: Community area 1 report, the effects of the Proposed Scheme on the Landscape Character Areas (LCA) of the Kings Bromley Terrace Alluvial Lowlands, the Trent Riparian Alluvial Lowlands and the Colton and Stockwell Heath Settled Farmlands will be major adverse (significant) during the operational phase. Landscape mitigation planting forms part of the Proposed Scheme in order to screen the Pipe Ridware embankment from Pipe Ridware and the users of Pipe Lane. Landscape earthworks have also been included on either side of the Proposed Scheme to aid integration of the route into the surrounding landscape.
- 2.1.3 The increase in the significant landscape and visual effects as a result of raising the River Trent viaduct and Pipe Ridware embankment would be difficult to mitigate at this location, since there is limited scope to provide additional landscape earthworks or planting beyond that which has already been provided.

Stockwell Heath embankment

- 2.1.4 Raising the vertical alignment of the Stockwell Heath embankment by up to 3m would increase the significant predicted landscape effects on the Colton and Stockwell Heath Settled Farmlands LCA and would also increase the significant predicted visual effects at a number of viewpoints. It would also introduce new significant effects on the communities of Stockwell Heath and Colton by increasing the number of visual receptors affected.
- 2.1.5 As described in the Volume 2: Community area 1 report, the effects of the Proposed Scheme on the landscape in this area will be major adverse (significant) during the operational phase. Landscape earthworks and mitigation planting to help screen this section of the route from Colton and integrate the route into the surrounding landscape is already proposed.
- 2.1.6 New and increased significant landscape and visual effects, which would be brought about by raising the vertical alignment of the Stockwell Heath embankment, would be difficult to mitigate, due to the height of the structures in relation to the existing landform. There is limited scope to provide additional landscape earthworks or planting beyond that which has already been provided.

2.2 CA2 - Colwich to Yarlet

Moreton cutting

- 2.2.1 Lowering the alignment and therefore widening Moreton cutting, or moving the alignment northwards at Moreton cutting, would reduce or remove proposed landscape mitigation planting to the north of the cutting, making it less effective in

providing visual screening between the Proposed Scheme and Mayfield Children's Home located within Moreton House, a Grade II listed building.

- 2.2.2 As described in the Volume 2: Community area 2 report, the effects of the Proposed Scheme in terms of noise in this area will be significant during both construction and operational phases. During construction, the occupants of Mayfield Children's Home and the acoustic character of the area around Moreton will be significantly affected. During operation, the impact of noise from the Proposed Scheme in the Moreton area will remain significant, with properties adversely affected likely to qualify for noise insulation.
- 2.2.3 Widening of the Moreton cutting or moving the alignment northwards at this location, would move the source of noise closer to sensitive receptors to the north of the route, such as Mayfield Children's Home and Moreton House Farm. In the case of such an alignment move or widening of the cutting, an increase in the height of noise barriers could be required to prevent an overall increase in noise levels at sensitive receptors and thereby prevent any new or different significant effects. The requirement for this would be determined through detailed noise modelling.

Great Haywood viaduct

- 2.2.4 The vertical alignment at the Great Haywood viaduct could be raised by up to 3m, but not lowered due to the clearance required for the Macclesfield to Colwich Line. An increase in the height of the viaduct would increase the prominence of the Proposed Scheme in views from the surrounding public rights of way (PRoW) network, the Trent and Mersey Canal Conservation Area and at locations within Shugborough Park, particularly the elevated Grade I listed Triumphal Arch. This would introduce new or increased landscape or visual effects at certain locations and may introduce new or increased effects on the setting of heritage assets.
- 2.2.5 As described in the Volume 2: Community area 2 report, the effects of the Proposed Scheme on the landscape character in the area of Great Haywood will be significant (major adverse) during both the construction and operational phases. During construction, the visual effects upon receptors in and around Great Haywood will be major adverse, particularly for those receptors in close proximity to the viaduct, where the structure will dominate the view. During operation, the visual effects will remain as major adverse at Year 1. With the maturation of mitigation planting to filter and integrate the Proposed Scheme into the surrounding landscape, the significant visual effects will be reduced to moderate adverse for Years 15 and 60.
- 2.2.6 Raising the height of the viaduct by up to 3m would increase the significant landscape character effects. An increase in the height of the viaduct would also increase the visual prominence of the viaduct in local and more distant views, particularly those at higher elevations. This could give rise to an increase in significant visual effects at those receptors already identified within the ES, and potentially introduce new significant visual effects to receptors, such as the PRoW network in the area, which were previously not significantly affected.
- 2.2.7 As described in the Volume 2: Community area 2 report, the effects of the Proposed Scheme on the heritage setting of the Trent and Mersey Canal Conservation Area and the Grade I listed Triumphal Arch, located within Shugborough Park, will be significant (moderate adverse) during both the construction and operational phases, primarily

resulting from its visual prominence within the landscape. The construction and operation of the Great Haywood viaduct will also introduce noise impacts into the setting of the Trent and Mersey Canal Conservation Area. During operation, trains on the viaduct will be prominent in the view, with intermittent crossings.

- 2.2.8 An increase in the height of the viaduct by up to 3m would increase the visual prominence of the viaduct in local and more distant views, particularly those at higher elevations. This could give rise to an increase in significant adverse setting effects upon receptors already identified within the ES and potentially introduce new significant setting effects on some heritage assets in Shugborough Park, which were previously not significantly affected.
- 2.2.9 New or increased significant adverse landscape, visual or setting effects resulting from an increase in the height of the Great Haywood viaduct would be difficult to mitigate at this location due to the height of the elevated structure and its position within the valley.

Hopton North cutting

- 2.2.10 Where the Hopton North cutting will pass by the village of Hopton, the horizontal alignment could move southwards, moving the cutting closer to Mount Edge.
- 2.2.11 As described in the Volume 2:Community area 2 report, the noise effects of the Proposed Scheme on the residents of Hopton will be significant during both the construction and operational phases. During construction, enhanced mitigation measures in the form of taller screening, is proposed to reduce noise from construction sites affecting the residential properties at Mount Edge. During the operational phase, properties along the southern edge of Hopton village and associated communal outdoor spaces will experience a significant adverse effect due to noise from HS2 trains. Properties at Mount Edge, closest to Hopton North cutting, will also experience a significant adverse effect. There are a limited number of individual properties, in and around Hopton, which will qualify for noise insulation. HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid the significant effects at Hopton and Mount Edge.
- 2.2.12 Moving the Hopton North cutting southwards would result in a slight reduction to noise levels at properties along the southern edge of Hopton. However, the noise levels at these properties would remain significant, and it is likely that noise insulation would still be required at some properties. Moving the cutting southwards would increase the significant effects at Mount Edge and potentially increase the number of properties qualifying for noise insulation. An increase in noise barrier height could be required to limit any increases in train noise levels resulting from moving the route closer to Mount Edge. The requirement for this would be determined through detailed noise modelling.

2.3 CA3 - Stone and Swynnerton

Stone Infrastructure Maintenance Base - Rail and associated reception tracks

- 2.3.1 Raising the height of the Stone IMB-R buildings, associated reception tracks and the Stone headshunt, together with the lighting for night-time working, would increase the prominence of the IMB-R within the landscape.
- 2.3.2 As described in the Volume 2: Community area 3 report, the effects on landscape character resulting from the Stone IMB-R and associated lighting are already considered to be moderate adverse (significant) for Year 1 and Year 15 for Yarnfield Settled Farmlands LCA, and major adverse (significant) for Year 1 and Year 15 for Swynnerton Park Sandstone Hills and Heath LCA, remaining as moderate adverse at Year 60. The effects of the Stone IMB-R and associated lighting on visual amenity result in significant adverse effects for a number of receptors up to Year 15, with views east from B5026 Eccleshall Road in the vicinity of Stafford Motorway Service Area (northbound) and from Chebsey Footpath 7 near Cold Norton remaining as a moderate adverse effect at Year 60.
- 2.3.3 Raising the alignment and height of the IMB-R buildings would result in an increase in significant landscape character effects on Yarnfield Settled Farmlands LCA and Swynnerton Park Sandstone Hills and Heath LCA. An increase in predicted significant visual effects would also be experienced by properties close to the IMB-R, including Darlaston Grange; properties located on Moss Lane and Yarnfield Lane; and Beech House Stud. There would also be new or increased significant visual effects on receptors at the following PRow viewpoints: Chebsey Footpath 7, Swynnerton Footpath 42, and Swynnerton Footpath 38.
- 2.3.4 Woodland planting around the Stone IMB-R and associated reception tracks already forms part of the Proposed Scheme and the scope for additional landscape planting is limited, particularly due to its restricted location between the route of the Proposed Scheme and the M6. Any increase in significant lighting effects as a result of raising the level of the IMB-R, would be the subject of further detailed assessment and mitigated through design where possible, within the limitations imposed by operational requirements.

Swynnerton embankment

- 2.3.5 Raising the vertical alignment of the Swynnerton embankment by up to 3m would increase its prominence in the surrounding landscape.
- 2.3.6 As described in the Volume 2: Community area 3 report, the effects on landscape character are already considered to be major adverse (significant) for Year 1 and Year 15 for Swynnerton Park Sandstone Hills and Heath LCA, remaining as moderate adverse (significant) at Year 60. The visual effects on receptors in the vicinity of Swynnerton embankment are considered to be significant up to Year 15, but the growth of planting at Swynnerton embankment integrating the Proposed Scheme into its landscape setting by Year 60, reduces the effects to non-significant.
- 2.3.7 An increase in the height of the alignment of the Proposed Scheme in this area would result in an increase in significant adverse landscape character effects on the

Swynnerton Park Sandstone Hills and Heath LCA, and new or increased significant visual effects for the residents at nearby properties, as well as on views from the following PRoW and public road viewpoints: Swynnerton Footpath 37, Swynnerton Footpath 27, Stone Rural Footpath 34, A51 Stone Road, Swynnerton Footpath 49, Stone Circles Challenge and Swynnerton Footpath 23.

- 2.3.8 Mitigation measures to provide landscape and visual screening have been included as part of the Proposed Scheme, including the provision of landscape earthworks and mitigation planting. The extent to which the existing mitigation could be refined or additional mitigation provided to account for a potential increase in height of the Swynnerton embankment would be limited. This may result in an increase in significant landscape effects on the Swynnerton Park Sandstone Hills and Heath LCA in Year 60, as well as increased significant visual effects, with the potential to create significant effects at Year 60, at viewpoints reported in the Volume 2: Community area 3 report.
- 2.3.9 A lowering of the vertical alignment is also possible, albeit limited due to the constraints of Swynnerton Estate South underbridge and Swynnerton new bridleway accommodation underbridge. This would be likely to result in a reduction in the adverse landscape and visual effects already reported in the Volume 2: Community area 3 report, which may become non-significant at some locations.

2.4 CA4 - Whitmore Heath to Madeley

Whitmore Heath tunnel

- 2.4.1 Raising the vertical alignment or altering the horizontal alignment of the Whitmore Heath tunnel within the limits of deviation would result in an increase in predicted significant ground-borne noise for residential properties above the route of the Proposed Scheme in Whitmore Heath.
- 2.4.2 As described in the Volume 2: Community area 4 report, significant ground-borne noise is predicted to occur at three properties above Whitmore Heath tunnel. If a change to the alignment was proposed, detailed modelling would be undertaken to confirm any increased significant noise effects. HS2 Ltd would seek reasonably practicable measures to reduce or avoid any significant effects. If reasonably practicable mitigation is not available, affected landowners would be entitled to make a claim in line with the compensation code.
- 2.4.3 If a substantial lowering of the vertical alignment of Whitmore Heath tunnel within the limits of deviation were to be practicable, this would be likely to reduce, and potentially avoid, significant ground-borne noise effects above the Whitmore Heath tunnel.

Whitmore Heath tunnel southern porous portal and A53 Newcastle Road overbridge

- 2.4.4 Raising the vertical alignment of the southern porous portal of Whitmore Heath tunnel within the limits of deviation would require the A53 Newcastle Road overbridge to be raised by a corresponding amount. The higher embankments that would be required on the approach to the overbridge on the east and west of the Proposed

Scheme would result in an increase in the significant predicted landscape and visual effects.

- 2.4.5 As described in the Volume 2: Community area 4 report, the effects of the Proposed Scheme on landscape character and views in this area are already considered to be significant adverse at this location. As woodland planting is already included around the portal as part of the Proposed Scheme, opportunities for additional landscape planting are limited.
- 2.4.6 As described in the Volume 2: Community area 4 report, the operational ground-borne noise effects of the Proposed Scheme in this area are expected to be significant for three properties located above the Whitmore Heath tunnel. If a change to the alignment was proposed, detailed modelling would be undertaken to confirm any significant ground-borne noise effects. HS2 Ltd would seek reasonably practicable measures to reduce or avoid any significant effects. If reasonably practicable mitigation is not available, affected landowners would be entitled to make a claim in line with the compensation code.
- 2.4.7 With the Proposed Scheme there are no operational airborne noise effects at Baldwin's Gate, Whitmore Heath or Whitmore, which comprise the sensitive receptors in proximity to the portal. If a change to the alignment is proposed, detailed modelling would be undertaken to confirm any new significant airborne noise effects and, if appropriate, mitigation in the form of noise barriers would be considered to avoid or reduce any significant effects.

Whitmore Heath tunnel northern porous portal to Whitmore north cutting

- 2.4.8 The design of Snape Hall Road drop inlet culvert and clearance requirements over the West Coast Main Line (WCML) and other Network Rail infrastructure at the River Lea viaduct restricts any substantial lowering of the vertical alignment of the Whitmore Heath tunnel northern porous portal. However, a minor lowering of the vertical alignment may necessitate alterations to the earthworks on the west side of Whitmore north cutting. If the permanent earthworks associated with Whitmore north cutting had to be extended within the limits of deviation, this would reduce the width of the narrow buffer between the permanent works and the currently unaffected area of Whitmore Wood, an ancient woodland. This could increase the risk of significant indirect adverse effects, such as those from noise disturbance, dust soiling and light pollution, upon habitat within the ancient woodland during construction. However, implementation of the measures set out in the Draft Code of Construction Practice (CoCP)¹ would provide appropriate construction mitigation so that significant adverse effects would be unlikely to arise.
- 2.4.9 Raising the northern portal of Whitmore Heath tunnel within the limits of deviation may slightly reduce the area of Whitmore Wood directly affected on the western cutting slope, but would be likely to increase airborne and ground-borne noise impacts upon nearby properties in Whitmore Heath.

¹ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice

- 2.4.10 As described in the Volume 2: Community area 4 report, the airborne and ground-borne noise effects of the Proposed Scheme will be significant for properties above Whitmore Heath tunnel and for a number of properties in proximity to Snape Hall Road. If the northern portal of Whitmore Heath tunnel were to be raised, detailed modelling would be undertaken to confirm any new or increased significant airborne or ground-borne noise effects. Further mitigation for airborne noise effects may be possible with additional noise barriers. If reasonably practicable mitigation is not available, affected landowners would be entitled to make a claim in line with the compensation code.

Madeley cutting to the south of the southern porous portal of Madeley tunnel

- 2.4.11 Lowering the vertical alignment at the Madeley tunnel southern porous portal, or moving the portal to the west, within the limits of deviation, would necessitate altering the earthworks that are in proximity to and within Barhill Wood, an ancient woodland.
- 2.4.12 If the permanent earthworks had to be extended within the limits of deviation, the width of the narrow buffer between the permanent works and the currently unaffected area of ancient woodland would be reduced. This could increase the risk of significant indirect adverse effects, such as those from noise disturbance, dust soiling and light pollution, upon habitat within Barhill Wood during construction. However, implementation of the measures set out in the Draft CoCP would provide appropriate construction mitigation so that significant adverse effects would be unlikely to arise.

2.5 CA5 - South Cheshire

Chorlton viaduct

- 2.5.1 Raising the vertical alignment of the Chorlton viaduct, which will carry the route of the Proposed Scheme over the proposed new section of the WCML, by up to 3m, would result in new or increased significant visual effects for residents of properties in Chorlton.
- 2.5.2 As described in the Volume 2: Community area 5 report, the visual effects of the Proposed Scheme in this area will be significant for residents of properties in Chorlton. Mitigation measures to provide visual screening of the Chorlton viaduct have been included as part of the Proposed Scheme. This includes the provision of landscape bunds off Waybutt Lane and landscape planting on the east side of the existing WCML and the new section of the WCML.
- 2.5.3 The extent to which the visual screening could be refined to account for an increase in height of the viaduct would be limited. However, there is some scope to raise the height of the currently proposed landscape bunds adjacent to Waybutt Lane, which together with associated landscape planting when it has reached maturity, could potentially reduce any new or increased residual significant visual effects.

Newcastle Road overbridge

- 2.5.4 Changes to the vertical alignment of the Newcastle Road overbridge would be feasible within highway standards. Raising the bridge and road level vertically would result in an increase in predicted significant visual effects for residents of properties along

Newcastle Road by increasing the visual prominence of the overbridge and associated earthworks.

- 2.5.5 As described in the Volume 2: Community area 5 report, the visual effects of the Proposed Scheme in this area will be significant for residential properties along Newcastle Road and Casey Lane in Year 1 of operation. Mitigation measures to provide visual screening of the Newcastle Road overbridge have been included as part of the Proposed Scheme. This includes the provision of landscape earthworks and landscape bunds with woodland planting along both sides of the realigned Newcastle Road.
- 2.5.6 There is limited scope for additional landscape earthworks or landscape planting in this area that would reduce the visual prominence of the overbridge and associated earthworks. Therefore, raising the height of the Newcastle Road overbridge would be likely to give rise to increased residual significant visual effects for residents of properties along Newcastle Road. These visual effects may reduce over time as the landscape planting reaches maturity.

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